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LADAS & PARRY
26 WEST 61ST STREET
NEW YORK, NY 10023

EXAMINER

CHAWAN, SHEELA C

ART UNIT	PAPER NUMBER
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2625

DATE MAILED: 08/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/031,045

Applicant(s)

GOLD ET AL.

Examiner

Sheela C. Chawan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 288 - 328, 340- 341, 354- 413, 421- 439, 422, is/are pending in the application.
- 4a) Of the above claim(s) 216-287, 329- 339, 342-353 and 414-420, is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 288- 316, 319, 320, 323-325, 328, 340, 341, 354- 361, 364- 377, 380, 381, 387- 396, 409 -412, 421, 422, 423- 430, 433- 437 is/are rejected.
- 7) ☒ Claim(s) 317, 318, 321, 322, 326, 327, 362, 363, 378, 379 and 382 - 386, 397-408, 413, 431-432, 438-439 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2/15/02.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: See Continuation Sheet.

Continuation of Disposition of Claims: Claims pending in the application are 288-291, 293- 309, 311-317, 319-320, 323-325, 328- 340, 341, 354- 360, 361, 364-377, 380-381, 384, 385, 387- 388, 399- 395, 409- 413, 421- 430, 433- 437.

Continuation of Attachment(s) 6). Other: continuation of claim disposition..

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The Examiner has approved drawings filed on 1/14/02.

Election/Restriction

3. Claims 216-287, 329-339, 342-353 and 414-420 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made without traverse filed on April 4, 2005.

Applicant's election without traverse of group VII, claims 288 - 328, 340-341, 354 - 413 and 421- 439 filed on 12/21/04 is acknowledged.

Claim Rejections - 35 USC § 112

4. Claims 383, 386, 431 and 432 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 383, lines 9- 10, analysis of the border image data using a "first technique" and "second technique" what does this mean? And what kind of technique are we talking about as recited in claim, which is indefinite, and unclear, similarly other claims need to be corrected.

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Allowable Subject Matter

5. Claims 317, 318,321,322, 326,327,362,363,378,379,382,384, 385, 398- 408 ,413, 438 and 439 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 288- 303, 316, 319, 320,323 - 325, 328, 340 -341, 354- 359,366,367,368, 373, 374, 375, 384, 387, 388,391,392,393, 396,410,411,421, 422, 423, 424,425,426,427, 428,429, 430, 433, 434, 436 and 437 are rejected under 35 U.S.C. 102(b) as being anticipated by Leonard et al., (US.4,928,313).

As to claims 288,289, 323, 421 and 422 Leonard discloses an automated optical inspection (fig 1, 14 subsystem corresponds to F/8 microscope zoom objective camera 16 fir imaging the circuit 12, column 6, lines 23- 26, 40-42, column 7, lines 12-18) device suitable for inspection of patterned articles (fig 1, 12 circuit board) comprising:

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at least one detector (fig 1, 14, ccd) providing a polychromatic image (column 6, lines 40- 66) output of at least a portion of a patterned article having a plurality of elements (column 6, lines 40- 66); and

processing circuitry (fig 1, 26) receiving said polychromatic image output and providing at least one of the following inspection functionalities (column 7, lines 12-26):

inspection of a metal coating on at least one of the elements in the plurality (column 4, lines 24- 42, column 6, lines 23- 26) of elements; and

inspection of an at least partially transparent coating on at least one element in the plurality of elements (column 4, lines 24- 56, column 6, lines 28- 31, 40-56, column 7, lines 60- 66).

As to claim 289 see the rejection of claim 288.

As to claims 290 and 291, Leonard discloses an automated optical inspection device wherein said processing circuitry receiving said polychromatic image output provides the following additional inspection functionality (column 6, lines 28- 31); detection of residues on a surface of said patterned article (fig 3).

As to claims 292 and 293, Leonard discloses an automated optical inspection device wherein said functionality of inspection of a metal coating on at least one of the elements in the plurality of elements comprises at least one of the following inspection modalities (fig 3, column 4, lines 35- 42, column 6, lines 28- 31):

detection of voids in the metal coating (column 4, lines 35- 42, column 6, lines 28- 31);

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As to claims 294 and 295, Leonard discloses an automated optical inspection device wherein said functionality of inspection of an at least partially transparent coating on at least one of the elements in the plurality of elements comprises at least one of the following inspection modalities (column 4, lines 24- 56, column 6, lines 40-56, column 7, lines 60-66):

detection of voids in the at least partially transparent coating (column 4, lines 24-56, column 6, lines 40-56, column 7, lines 60-66);

As to claims 296 and 297, Leonard discloses an automated optical inspection device wherein said functionality of detection of residues on a surface of said patterned article comprises at least one of the following detection modalities (column 4, lines 24-56, column 6, lines 40-56, column 7, lines 60-66):

detection of surface irregularities on a surface of said patterned article (column 10, lines 3- 14);

As to claims 298, 299, 374, 384,387, 392, 397 and 410, Leonard discloses an automated optical inspection device wherein the patterned article comprises an electrical circuit (fig 1, 12).

As to claims 300, 301 and 367, Leonard discloses an automated inspection device wherein the elements comprise conductors in the electrical circuit (fig 12, 12, column 4, lines 24- 30).

As to claims 301, 358, 368, discloses Leonard an automated inspection device wherein the elements comprise conductors in the electrical circuit (fig 1, 12, column 4, lines 24-30).

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As to claims 302, 303, 359, 375, 388, 393 and 411, Leonard discloses an automated optical inspection device according to claim 300 and wherein the electrical circuit comprises a printed circuit board (column 6, lines 32-39).

Regarding claims 316, 319 and 423, argument analogous those presented for claim 1 are applicable to claim 316, as taught by Leonard a processing circuitry receiving said polychromatic image output and providing edge detection (fig 7) to sub-pixel accuracy operative to distinguish borders among regions of different color (column 9, lines 15 – 24, 57- 68).

As to claims 320 and 321, Leonard discloses an automated optical inspection device suitable for inspection of an article and comprising:

at least one detector providing an image output of at least a portion of an article having at least three different regions, each of which regions is distinguished at least by an optical characteristic detectable by said detector (column 8, line 59 through column 9, line 24); and

processing circuitry receiving said image output and providing edge detection (fig 7) to sub-pixel accuracy (column 9, lines 59-68) operative to distinguish borders of at least two of said at least three different regions (column 9, lines 15-24, 57-68, column 8, line 59 through column 9, line 24).

Regarding claims 323, argument analogous those presented for claim 1 are applicable to claim 323, as taught by Leonard processing circuitry receiving said image output and providing mapping based at least partially on said image output which

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identifies materials in each of different regions of said at least a portion of said article having a common border (column 9, lines 25-68).

As to claim 324, Leonard discloses and wherein said processing circuitry is operative to sub-pixel accuracy (column 9, lines 57-68).

Regarding claims 325, 426, 433 and 391 argument analogous those presented for claim 1 are applicable to claim 325 and 426, 433, 391 as taught by Leonard segmentation (fig 5) of said polychromatic image into a segmented color image comprising a plurality of color regions color possibilities (column 9, lines 25-36); binarization of the segmented color image into a binary image including regions and borders (column 2, lines 62-68, column 3, lines 1-12);

morphological erosion of the regions to provide a skeleton (column 10, lines 7-14) representing the regions (column 10, lines 1-14); and

assignment of color regions to elements in the skeleton (column 2, lines 62-68, column 9, lines 1-24).

As to claim 328, see the rejection of claim 1, above.

Regarding claims 340 and 427, argument analogous those presented for claim 1 are applicable to claims 340 and 427, as taught by Leonard processing circuitry receiving said polychromatic image output and providing a color image representing said article, the color image comprising a morphologically eroded polychromatic image of at least part of said article (fig 10, column 10, lines 1-14).

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As to claim 341, Leonard discloses an automated optical inspection device wherein colors of portions of said morphologically eroded polychromatic image indicate materials at various regions of the article (column 10, lines 1-14, column 4, lines 24-42).

Regarding claims 354, 424, 425 and 428, argument analogous those presented for claim 1 are applicable to claims 354, 424, 425 and 428, as taught by Leonard processing circuitry (fig 1, 26) receiving said polychromatic image output and providing a color image representing said article (column 7, lines 12-26), the color image comprising a map which indicates borders between different regions of an article and identifies materials in each of said different regions having a common border (column 9, lines 15-56).

As to claim 355, Leonard discloses an automated optical inspection device wherein colors of portions of said map indicate materials at various regions of the article (column 9, lines 25-68).

As to claim 356, Leonard discloses an automated optical inspection device wherein said processing circuitry receives said image output and provides border indication to sub-pixel accuracy (column 9, lines 25-68).

As to claim 357, Leonard discloses an automated optical inspection device wherein each color comprises a color chosen from among a predetermined possibility of colors (column 6, lines 40- 68).

Regarding claims 366 and 429, argument analogous those presented for claim 1 are applicable to claims 366 and 429, as taught by Leonard processing circuitry receiving said image output and providing an inspection functionality comprising

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binarization of the image output to provide a binary image including region image data and border image data (column 8, lines 45-62, column 9, lines 1-24).

Regarding claims 373 and 430, argument analogous those presented for claim 1 are applicable to claims 373 and 430, as taught by Leonard processing circuitry receiving said image output and providing an inspection functionality comprising pattern analysis of image data relating to the borders to provide an indication of the presence of nicks and protrusions along said borders (fig 3).

As to claims 396 and 434, see the rejection of claim 1.

Regarding claims 436 and 437, argument analogous those presented for claim 1 are applicable to claims 436 and 437, as taught by Leonard acquiring polychromatic images and outputting a report indicating candidate defects and feature chosen from among a predetermined set of features, and providing an image of a region surrounding each said candidate defect and feature (column 8, lines 45-68, column 9, lines 1- 56).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

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Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103 and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 304, 305, 308-311, 360, 369, 376, 389, 394, 412 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leonard et al., (US.4,928,313), as applied to the above claims 288- 303, 316, 319, 320, 323 - 325, 328, 340 - 341, 354 - 359, 366, 367, 368, 373, 374, 375, 384, 387, 388, 391, 392, 393, 396, 410, 411, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 433, 434, 436 and 437, and further in view of Lodlow et al., (US. 6,201, 892 B1).

Regarding claim 304, 305, 310, 311, 360, 369, 376, 389, 394, and 412 Leonard discloses a method and system for automatically visually inspecting an articles such as electronic circuits. Leonard is silent about electrical circuit comprises a ball grid array substrate.

Ludlow discloses a system and method that enhances the detectability of selected reflective features on an object being inspected, such as solder balls,

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protrusions, intrusions, deviations, concavities, data matrices, one and two-dimensional identification codes, the shapes of certain features, such as solder joints, as well as other reflective or non-reflective features on an article, including missing features.

Thus, the disclosed system and method aids in the improvement of inspection processes and methods. The system comprises of:

an automated optical inspection device wherein the electrical circuit comprises a ball grid array substrate (column 1, lines 54- 57).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Leonard to include an automated optical inspection device wherein the electrical circuit comprises a ball grid array substrate. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Leonard by the teaching of Lodlow in order to enhances the detectability of selected reflective features on an object being inspected, such as solder balls, protrusions, intrusions, deviations, concavities, data matrices, one and two-dimensional identification codes, the shapes of certain features, such as solder joints, as well as other reflective or non-reflective features on an article, including missing features. Thus, the disclosed system and method aids in the improvement of inspection processes and methods (as suggested by Lodlow at column 17, 42- 51).

As to claims 308 and 309, Lodlow discloses an automated optical inspection device wherein the metal coating comprises a metal plating (column 2, lines 41- 47).

8. Claims 306, 307, 361, 370, 377, 390 and 395 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leonard et al., (US.4,928,313), in view of

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Lodlow et al., (US. 6,201, 892 B1) 288- 303, 304, 305,308, 309, 310, 311, 316, 319, 320,323 - 325, 328, 340 -341, 354 - 359, 360, 366,367,368, 369, 373, 374, 375, 376, 384, 387, 388, 389, 391,392,393, 394, 396,410,411,421, 422,423, 424,425,426,427, 428,429, 430, 433, 434, 436 and 437, as applied to the above claims and further in view of Vachtsevanos et al., (US. 6,269, 179 B1).

Regarding claim 306, 307, 361, 370, 377, 390 and 395 Leonard discloses a method and system for automatically visually inspecting articles such as electronic circuits. Leonard is silent about electrical circuit comprises a ball grid array substrate. Leonard is silent about an automated optical inspection device wherein the patterned article comprises a lead frame.

Vachtsevanos discloses a systems and more particularly, to an inspection system and method for bond detection and validation of surface mount devices using vision and infrared sensors, combined with a technique for discriminating and detecting solder joint defects. The system comprises of:

an automated optical inspection device wherein the patterned article comprises a lead frame (fig 11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Leonard to include an automated optical inspection device wherein the patterned article comprises a lead frame. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Leonard by the teaching of Vachtsevanos offers a reliable and time efficient system for solder joint inspection (as suggested by Vachtsevanos at column 2, lines 42- 44).

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As to claim 310 discloses an automated optical inspection device according to claim 304 and wherein the elements comprise balls in the ball grid array substrate.

An automated optical inspection device according to claim 305 and wherein the elements comprise balls in the ball grid array substrate.

9. Claims 312-315, 409,435, 364, 365, 371, 372, 380 and 381 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leonard et al., (US.4,928,313), in view of Lodlow et al., (US. 6,201, 892 B1), in view of Vachtsevanos et al., (US. 6,269, 179 B1) as applied to the above claims (288- 303, 304, 305, 306, 307, 308, 309, 310, 311, 316, 319, 320,323 - 325, 328, 340 -341, 354 - 359, 360, 361, 366,367,368, 369, 370, 373, 374, 375, 376, 377, 384, 387, 388, 389, 390, 391,392,393, 394, 395, 396,410,411,421, 422, 423, 424,425,426,427, 428,429, 430, 433, 434, 436 and 437 and further in view of Corral (US. 6,489, 586 B1).

Regarding claim 312, 313, 364, 371 and 380 Leonard discloses a method and system for automatically visually inspecting an articles such as electronic circuits.

Leonard is silent about electrical circuit comprises a ball grid array substrate. Leonard is silent about an automated optical inspection device patterned article comprises an etched metal substrate.

Corral discloses a method and apparatus for verification of assembled printed circuit boards .The system comprises of:

an automated optical inspection device patterned article comprises an etched metal substrate (column 6, lines 6- 21).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Leonard to include an automated optical inspection device wherein the patterned article comprises an etched metal substrate. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Leonard by the teaching of Corral which discloses an overlay device and method of making an overlay for verifying the placement of components on PCB's in order to provide users a relatively simple, accurate and inexpensive way of verifying the correct assembly of components on a PCB (as suggested by Corral at column 2, lines 43- 47).

As to claims 314, 315, 365, 372 and 381 Corral discloses an automated optical inspection device wherein the patterned article comprises an engraved metal substrate (column 6, lines 6- 21).

As to claim 409 and 435 Corral discloses an automatic optical inspection device suitable for inspection of a patterned article comprising (abstract, column 3, lines 37- 64):

at least one detector (column 5, line 62 through column 6, line 37) providing an image output of at least a portion of a patterned article through a translucent overlay at least partially covering the patterned article (column 6, line 38 through column 7, line 11);and

processing circuitry receiving said image output and providing an output indication, which is independent of the translucent overlay (column 5, line 62 through column 6, line 37, column 6, line 38 through column 7, line 11).

Contact Information

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sheela C Chawan whose telephone number is. 571-272-7446 The examiner can normally be reached on Monday - Friday 7.30 - 4.00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 571-272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sheela Chawan
Patent Examiner
Group Art Unit 2625
July 11, 2005